

Attorney Docket No.: 051481-5071
Application No.: 09/888,618
Page 2 of 9

IN THE CLAIMS

1. (currently amended) An air mass flow controller valve for fuel cells, the flow controller valve comprising:
 - an inlet disposed along a first axis;
 - at least two channels in communication with the inlet, the at least two channels disposed along a second axis;
 - at least one air mass sensor disposed proximate each of the at least two channels;
 - a seat portion disposed in each of the at least two channels;
 - at least two closure members, one of the at least two closure members disposed proximate one channel of the at least two channels, the other of the at least two closure members disposed proximate the other channel of the at least two channels, each closure member including a stem extending from a seating member and being movable to a plurality of positions, a first position permitting air flow in a respective channel, and a second position preventing air flow in a respective channel; and
 - ~~at least two actuators, one of the at least two actuators coupled contiguously to one of the at least two closure members, the other of the at least two actuators coupled contiguously to the other of the at least two closure members, each actuator including an armature and an electromagnetic coil, a respective stem extending into a respective electromagnetic coil and being coupled to a respective armature,~~ each of the at least two actuators responsive to a respective air mass sensor to move a respective closure member between the first position and the second position.
2. (original) The valve of claim 1, wherein the seat portion further comprises an annular seat having a third axis transverse to one of the first axis and second axis.
3. (previously presented) An air mass flow controller valve for fuel cells, the flow controller valve comprising:
 - an inlet disposed along a first axis;
 - at least two channels in communication with the inlet, the at least two channels disposed along a second axis;
 - at least one air mass sensor disposed proximate one of the at least two channels;

Attorney Docket No.: 051481-5071
Application No.: 09/888,818
Page 3 of 9

a seat portion disposed in one channel of the at least two channels;
at least two closure members, one of the at least two closure members disposed proximate one channel of the at least two channels, the other of the at least two closure member disposed proximate the other channel of the at least two channels, each closure member movable to a plurality of positions, a first position permitting air flow in each channel from the inlet and a second position preventing communication in one channel of the at least two channels and the inlet; and

at least two actuators coupled to a respective one of the at least two closure members, the at least two actuators responsive to one of the air mass sensors in each channel of the at least two channels to move a respective one of the at least two closure members between the first position and the second position,

wherein the inlet further comprises a portion having a first cross sectional area and a second cross sectional area proximate the at least two channels, the second cross sectional area being greater than the first cross-sectional area.

4. (previously presented) An air mass flow controller valve for fuel cells, the flow controller valve comprising:

an inlet disposed along a first axis;
at least two channels in communication with the inlet, the at least two channels disposed along a second axis;
at least one air mass sensor disposed proximate one of the at least two channels;
a seat portion disposed in one channel of the at least two channels;
at least two closure members, one of the at least two closure members disposed proximate one channel of the at least two channels, the other of the at least two closure member disposed proximate the other channel of the at least two channels, each closure member movable to a plurality of positions, a first position permitting air flow in each channel from the inlet and a second position preventing communication in one channel of the at least two channels and the inlet; and

at least two actuators coupled to a respective one of the at least two closure members, the at least two actuators responsive to one of the air mass sensors in each channel of the at least two

Attorney Docket No.: 051481-5071
Application No.: 09/888,618
Page 4 of 9

channels to move a respective one of the at least two closure members between the first position and the second position,

wherein the at least one air mass sensor comprises a pressure sensor disposed in the inlet and a position sensor that senses the position of the actuator.

5. (original) The valve of claim 2, wherein the closure member is disposed proximate the annular seat, the closure member operable to move along the third axis between the first position and second position.

6. (previously presented) The valve of claim 1, wherein each of the at least two channels further comprises an inlet portion disposed along the second axis and an outlet portion disposed along a fourth axis spaced from the second axis by a distance, the distance between the second axis and the fourth axis defining the seat portion.

7. (original) The valve of claim 6, wherein the seat portion further comprises a seating surface in a confronting arrangement with the closure member, the seating surface having at least one seal disposed between the seating surface and the closure member.

8. (original) The valve of claim 1, wherein each of the at least of the two actuators further comprises a sliding bearing, the sliding bearing configured to permit the closure member to reciprocate between the first position and the second position.

9. (previously presented) The valve of claim 6, wherein the at least two actuators further comprise a housing for each actuator, the housing having a first wall and a second wall disposed along the third axis, a third wall disposed along the second axis and a fourth wall disposed along the fourth axis, the first and third walls formed as part of the inlet portion, the second and fourth walls formed as part of the outlet portion.

10. (original) The valve of claim 9, wherein the housing further comprises a sensor cap configured to couple with the first wall and second wall in a locking arrangement.

11. (original) The valve of claim 10, wherein the sensor cap further comprises an electrical connector.

Attorney Docket No.: 051481-5071
Application No.: 09/888,618
Page 5 of 9

12. (original) The valve of claim 9, wherein the first and third walls of each actuator are orthogonal to the first and third walls of the other actuator of the at least two actuators.

13. (original) A method of distributing metered airflow from an inlet to a plurality of channels in a fuel cell, each channel of the plurality of channels provided with an air mass flow sensor that provides a signal indicating measured air amount flowing in each channel of the plurality of channels, a plurality of closure members, each closure member being contiguous to a seat portion and disposed in a respective channel of the plurality of channels, each closure member being movable by an actuator between a first position to permit flow and a second position to prevent flow, the method comprising:

flowing air to the inlet;

determining an air mass amount in each channel of the plurality of channels; and

metering the air mass amount provided to each channel from the inlet as a function of a desired air amount and the air mass amount determined in each channel.

14. (previously presented) A method of distributing metered airflow from an inlet to a plurality of channels in a fuel cell, each channel of the plurality of channels provided with an air mass flow sensor that provides a signal indicating measured air amount flowing in each channel of the plurality of channels, a plurality of closure members, each closure member being contiguous to a seat portion and disposed in a respective channel of the plurality of channels, each closure member being movable by an actuator between a first position to permit flow and a second position to prevent flow, the method comprising:

flowing air to the inlet;

determining an air mass amount in each channel of the plurality of channels; and

metering the air mass amount provided to each channel from the inlet as a function of a desired air amount and the air mass amount determined in each channel;

wherein the flowing air further comprises flowing air in a passage with a first portion and a second portion, first portion having a first cross section area and the second portion with a second cross sectional area, the second cross sectional area being greater than the first cross sectional area.

Attorney Docket No.: 051481-5071
Application No.: 09/888,618
Page 6 of 9

15. (original) The method of claim 13, wherein the determining of the air mass amount further comprises sensing a voltage of a transducer disposed in each channel of the plurality of channels.

16. (original) The method of claim 13, wherein the metering further comprises modulating the closure member between the first position and the second position.

17. (original) The method of claim 16, wherein the modulating further comprises reciprocating the closure member in response to pulse width modulated signals.

18. (original) The method of claim 16, wherein the modulating further comprises feedback controlling the closure member between the first position and the second position based on a difference between the desired air amount and determined air amount.

19. (previously amended) An air mass flow controller valve for fuel cells, the flow controller valve comprising:

an inlet disposed along an inlet axis;

first and second channels in communication with the inlet, the first and second channels being respectively disposed along a first channel axis and a second channel axis;

an air mass sensor disposed proximate the first channel;

first and second seat portions being respectively disposed in the first and second channels;

first and second closure members being respectively disposed in the first and second channels, each closure member including a stem extending from a seating member and being movable between a first position permitting air flow in its respective channel and a second position preventing airflow in its respective channel; and

first and second actuators ~~being respectively coupled contiguously to the first and second closure members,~~ each including an armature and an electromagnetic coil, a respective stem extending into a respective electromagnetic coil and being coupled to a respective armature, the first actuator being responsive to the air mass sensor to move the first closure member between the first position and the second position.